ION WAVE PARAMETRIC DECAY AND RELATED INSTABILITIES *

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The ion wave parametric decay instability is the decay of a finite amplitude ion acoustic wave, perhaps driven by SBS, into a pair of lower frequency ion modes.[1] Earlier work [2] showed that the most unstable mode was for decay into a pair of collinear half-harmonic ion waves. However, this earlier work neglected both anti-Stokes coupling and ion-wave dispersion. We find that absent ion wave dispersion, resonant anti-Stokes coupling to the three-halves harmonic stabilizes the instability. However, further inclusion of ion wave dispersion restores a region of instability by detuning the anti-Stokes coupling. Simultaneously, it weakens the competing energy sink of harmonic generation on the pump (ion) wave. We have recently rederived the dispersion relation using kinetic ions, allowing us to investigate induced scattering, and threshold effects from the Landau damping of the decay waves. Our previous work included the effects of ion wave dispersion and anti-Stokes coupling, but used a cold fluid model for the ions.

[1] B. I. Cohen, B. F. Lasinski, A. B. Langdon, and E. A. Williams, UCRL-JC-124922 (July 1996), accepted by Physics of Plasmas.

[2] Karttunen et. al. Phys. Lett. V72A, 336 (1979), W. L. Kruer, From Fusion to Light Surfing, ed. T. Katsouleas